

Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the application.

What is claimed is:

1. (amended) A process for locating a leak in a pipeline, which comprises:

(d) ~~(a)~~ continuously sensing acoustic events which occur in proximity to the pipeline and the location along the pipeline at which they occur, selecting those consistent with a leak in the pipeline or a collision with the pipeline as acoustic events of interest; and noting the location or locations where they occur;

(b) sensing the temperature along the pipeline;

(c) noting any locations along the pipeline where the temperature differs from the locations adjacent to it by a predetermined amount; noting any such location as a location of a temperature event of interest,

(d) when an acoustic event of interest and a temperature event of interest occur within a preselected time period at approximately the same location along the pipeline, noting such location as the probable site of a leak.

2. (original) A process as claimed in claim 1, in which the sensing of the temperature along the pipeline is done continuously.

3. (original) A process as claimed in claim 1 in which the sensing of the temperature along the pipeline is carried out with sensing apparatus oriented so that fluid escaping from the pipeline is likely to contact it.

4. (amended) A process as claimed in ~~either of claims 2 or 3~~ claim 1 in which the sensing of acoustic events is carried out by a distributed fibre optic acoustic sensor.

5. (amended) A process as claimed in ~~any of claims 1-4~~ claim 1 in which the sensing of temperature is carried out by a distributed fibre optic temperature sensor.

6. (amended) A process as claimed in ~~any of claims 1-5~~ claim 1 in which the pipeline is at least partially above ground.

7. (original) Apparatus for sensing leaks in a pipeline, which comprises:

(i) temperature sensing means for determining temperature along the exterior of the pipeline;

(ii) means for collecting data sensed by such temperature sensing means and for determining locations, if any, where the temperature of the exterior of the pipeline differs by at least a predetermined amount from the temperature of the exterior of the pipeline at adjacent locations along it;

(iii) acoustic sensing means for detecting acoustic events occurring along the pipeline, and the location of such events; and

(iv) means for collating the output of such acoustic sensing means and said temperature sensing means to determine situations where there is an acoustic event, with a substantially contemporaneous temperature change occurring at the same location.

~~8.~~ (original) Apparatus as claimed in claim 7, in which the pipeline is substantially above ground and visible from above, and the temperature sensing means is mounted on an air or space-borne vehicle.

9. (original) Apparatus as claimed in claim 7, in which said temperature sensing means is a distributed fibre optic temperature sensor.

~~10.~~ (original) Apparatus as claimed in claim 9, in which the distributed fibre optic temperature sensor is below the pipeline and substantially adjacent to it, whereby liquid leaking from the pipeline is likely to impinge on such sensor.

11. (amended) Apparatus as claimed in ~~any of claims 7-10~~ claim 7, in which the acoustic sensing means is a distributed fibre optic acoustic sensor.

12. (new) Apparatus as claimed in claim 8, in which the acoustic sensing means is a distributed fibre optic acoustic sensor.

13. (new) Apparatus as claimed in claim 9, in which the acoustic sensing means is a distributed fibre optic acoustic sensor.

14. (new) Apparatus as claimed in claim 10, in which the acoustic sensing means is a distributed fibre optic acoustic sensor.

15. (new) Apparatus for sensing leaks in a pipeline which comprises:
(a) a fibre optic distributed acoustic sensor;
(b) means for analyzing the data output of such fibre optic acoustic sensor resulting from acoustic events impinging on it;
(c) means for selecting from such analysis of acoustic events and their location of origin along the pipeline.

16. (new) Apparatus as claimed in claim 15, including means for selecting as anomalous events those events which appear to have their origin in a single short length of the pipeline.

17. (new) A process as claimed in claim 2, in which the sensing of acoustic events is carried out by a distributed fibre optic acoustic sensor.

18. (new) A process as claimed in claim 3, in which the sensing of acoustic events is carried out by a distributed fibre optic acoustic sensor.